

NEW PLANET.

Extracts of Letters from Mr. Hermann Goldschmidt to Mr. Hind.

“Paris, October 30th, 1854.

“I have the pleasure to inform you of the discovery I made in the evening of the 26th inst. of a new (32) planet. It appears as a star of the 11th magnitude. I give you the approximate positions for facilitating its research, and also those of the Imperial Observatory.

Approximate Graphical Positions.

	Paris M.T.	R. A.	Decl.
	^h ^m	^h ^m ^s	[°] [']
Oct. 26	10 0	2 26 13	+ 15 5
27	8 30	25 23	15 0
	17 20	2 25 6	+ 14 58

Positions of the Observatory.

	Paris M.T.		
Oct. 28	13 ^h 18 ^m 11 ^s .2	R.A. = R.A. * - 6 ^m 33 ^s .94	
		δ = δ * + 3' 34".8	
		Approx. Place of Star	R.A. = 2 ^h 30 ^m 55 ^s δ = + 14° 51'.5
Oct. 29	11 ^h 51 ^m 52 ^s .0	R.A. = R.A. * + 7 ^m 1 ^s 80	
		δ = δ * - 6' 0".2	
		Approx. Place of Star, = R.A. = 2 ^h 16 ^m 33 ^s	δ = + 14° 44'
Oct. 29	11 ^h 51 ^m 40 ^s .1	R.A. = 2 ^h 23 ^m 33 ^s .03	Meridian.

“Paris, November 3d, 1854.

“I certainly owe the discovery to your beautiful ecliptical charts, which have been in my possession a few months.

“Mr. Le Verrier selected the name *Pomona* for this 32d planet.”

Notes on Chinese Astronomy. By John Williams, Esq.

“In presenting the Society with some illustrations of Chinese astronomy, I feel myself called upon to give some account and explanation of them.

“The first is a complete Chinese celestial atlas, in thirty-two maps. These, with one exception, have been traced from a work forming part of the Chinese Library of the late Dr. Morrison, now in the possession of University College, Gower Street, and which, by the kindness of Professor De Morgan, I have had an opportunity of examining during the past summer. This work is in 150 volumes; it is entitled ‘Illustrations of the three great Principles of Nature.’ These, according to the Chinese, are heaven, earth, and man. The first part of this work is devoted to astronomy. The maps have been carefully compared with those in other Chinese astro-

nomical works which have come under my observation, and also with the Chinese star-maps in the possession of the Society, and the positions of the several asterisms, ascertained as accurately as possible, by collation with European maps, and by comparing them with the 'Names of Stars and Constellations' in Dr. Morrison's Chinese Dictionary, collected for that work by John Reeves, Esq. F.R.A.S. They have likewise been compared with a catalogue in a work entitled '*Observationes Mathematicæ et Physicæ in India et China factæ a Patre Francisco Noel. Soc. Jes.*' 4to., Prague, 1710, which I have now the pleasure of presenting to the Society, and also in many instances with the heavens themselves. The results are given in the margin of each map, where will be found the Chinese name of the star or constellation in the original character, and also in English letters, with a reference to the corresponding stars in European maps. The maps are arranged according to the Chinese custom, their order being from right to left.

"The second consists of a pair of celestial planispheres of large size, published in this country about a century ago, and formerly belonging to the Mathematical Society of Spitalfields. On these I have traced in red lines the corresponding Chinese asterisms, with their names in the original characters and in English letters. The Chinese astronomers divide the visible heavens as seen in their country into thirty-one parts. Twenty-eight of these may be considered as answering to our zodiac, or, perhaps, rather to the twenty-eight lunar mansions of the astrologers. The other three are called by a word signifying a wall or enclosure, and which also implies an enclosed space. The first of these consists of the northern circumpolar stars. It comprises stars in *Ursa Minor*, *Draco*, *Cepheus*, *Cassiopeia*, *Ursa Major*, *Camelopardalis*, *Boötes*, and *Auriga*. The second comprises *Hercules*, part of *Ophiuchus*, *Serpens*, *Corona Borealis*, and part of *Boötes*. The greater portion of this is bounded by a line drawn from β *Herculis* through the head and body of *Serpens*, and the lower part of *Ophiuchus*, thence through the remainder of *Serpens* to δ *Herculis*. The third division is bounded principally by stars in *Virgo* and *Leo*, and consists of part of the constellations *Virgo*, *Leo*, *Leo Minor*, *Boötes*, *Ursa Major*, and the whole of *Coma Berenices*; I have distinguished the names of these three divisions by inscribing them within an orange-coloured line.

"The remaining twenty-eight divisions comprise the rest of the heavens. They are exceedingly unequal in extent, some containing many degrees of right ascension, others very few. They take their names from a group of stars generally situated in the centre of each division. The surrounding groups have various names, and in this respect answer in some measure to our constellations. They are, however, far more numerous. The figures of these groups, or constellations as they may be called, have no resemblance whatever to those given in European maps, the stars of each asterism being connected merely by straight lines.

"It is, however, considered that each of these twenty-eight divisions or constellations has a particular animal on earth which corresponds to it, and also that it is under the influence of one of the seven heavenly bodies, which are the Sun, the Moon, and the five planets, *Mercury, Venus, Mars, Jupiter, and Saturn*. Some authors say that twenty-eight celebrated generals, who flourished during the Han dynasty, *i.e.* from B.C. 206 to A.D. 223, were, after death, changed into these twenty-eight constellations; thus affording a curious correspondence with the ancient astronomy of the western world, in which celebrated characters are fabled to have been changed after death into constellations. The Chinese also parcel out these twenty-eight divisions into four portions of seven each. According to them, the first seven are to be reckoned from the south towards the east; the stars from which they take their names are situated in *Virgo, Libra, Scorpio, and Sagittarius*. The next seven are between the east and north, consisting of stars in *Sagittarius, Capricornus, Aquarius, Pegasus, and Andromeda*. Seven are situated between the north and west, comprising stars in *Andromeda, Aries, Musca, Taurus, and Orion*; and the remaining seven, between the west and south, being stars in *Gemini, Cancer, Hydra, Crater, and Corvus*. It must, however, be observed, that these divisions are not only very unequal in extent from east to west, but also from north to south, and that they differ exceedingly in the comparative number of stars in them. Thus the division *Ke* consists only of four stars in *Sagittarius* and *Telescopium*, forming the central group giving the name, and three stars in *Ara*, while the division *Tsing* consists of the whole of *Gemini*, having to the north stars in *Perseus*, and to the south stars in *Canis Minor, Monoceros, Canis Major, Argo, and Columba*. Again, the division *Tsuy* comprises the stars in the head of *Orion*, and a few to the north in *Auriga*; and the succeeding one, *Tsan*, consists of the remaining bright stars in *Orion* and stars in *Lepus, Columba, and Eridanus*. I instance these as examples of the extreme inequality of the several divisions.

"In these planispheres I have distinguished the names of the twenty-eight divisions by inscribing them within blue lines.

"In addition to the thirty-one divisions of the visible heavens, I have inserted, both in the planispheres and in the atlas, the southern stars not visible in China. These are taken from one of the star-maps in the possession of the Society; and I must here observe that, however ancient and original the northern asterisms of the Chinese may be considered, there is internal evidence to prove that these southern constellations, at least, have been derived from European sources. Thus the constellation *Phœnix* is called in Chinese 'Fire Bird;' *Dorado*, 'Gold Fish;' *Apis*, 'Honey Bee;' and so on; and the stars of each constellation are also confined to the figures, as given in our maps,—a circumstance which does not occur in the more northern asterisms.

"In tracing upon these planispheres the Chinese asterisms, every care has been taken to render them as accurate as possible. The

chief authorities from which they were taken were the Chinese star-maps in the possession of the Society. These consist of

- “Two planispheres, giving the northern and southern hemispheres. Presented by Capt. Sir E. Home, Bart. R.N.
- “The northern and southern hemispheres, in one sheet, with a list of the constellations and other particulars.
- “An impression from the wooden block in the possession of the Society, showing the stars visible in China.
- “Two planispheres in manuscript, giving the northern and southern hemispheres. On these the figures of the asterisms are very neatly drawn, and their names very distinctly written. The number of the stars in each constellation is also given, and each star has its corresponding number.
- “A planisphere, showing the stars visible in China, and in a smaller circle, the southern stars not visible in the north of that country.
- “The whole of these were presented by Mr. Reeves.

“The first three of these are evidently from European authorities, as divisions and numerals appear on them, which could not be derived from any other source. They are also rather meagre in names, often in many parts ill printed, and much confused in the details.

“The last two are more distinct, and appear also to be more original; and these formed the basis of the work I had undertaken, and afforded me very valuable information and assistance in it. Every group of stars in these was carefully examined; the relative position of each star determined as accurately as possible, and verified by comparison with Mr. Reeves' valuable contribution to Dr. Morrison's Dictionary, to which I have before alluded. They were also compared with the catalogue in Father Noel's work, also mentioned before. This I found of great assistance in doubtful cases. The other planispheres were also referred to occasionally; and although I cannot be satisfied that in every instance I have attained perfect accuracy, still I may confidently say that the positions assigned are, generally speaking, sufficiently correct for all ordinary purposes.

“The work by Father Noel, to which I have more than once alluded, is the third contribution to this subject. Among other things, it contains an account and explanation of the Chinese cycle of 60 years, and of the mode of its formation. It also contains a catalogue of stars, or rather asterisms, arranged according to our constellations, with the Chinese names in English characters, spelt according to the Portuguese method.

“In one part of the work the author regrets being compelled to omit the original Chinese characters for the names, &c., as he had no means of procuring the requisite types. This defect I have supplied in manuscript; and the necessity of it will be sufficiently apparent when I inform you that the Chinese vocables, being very limited, each has, in consequence, to express the sense

of many characters, whose form and meaning are totally different. Thus the characters answering to the sound of our letter E are at the least not fewer than 267, all of them distinct in their meaning, and varying exceedingly in their forms. It, consequently, follows that any attempt to ascertain the meaning of the simple vocable E occurring in a Chinese sentence written in European letters, would be almost, if not absolutely, unavailing without the original character intended to be expressed by that sound.

“In conclusion, I have only to express my hope that the pains I have bestowed on this subject will not be entirely without their use to such persons as may hereafter have occasion to investigate Chinese astronomy. At all events, they will save a vast deal of preliminary labour, which would, of necessity, be required before the party could be in a position to proceed satisfactorily with the object he might have in view. I may also state that it is possible I may, on some future occasion (should it be agreeable to the Society), enter more at large upon Chinese astronomy; and by giving an analysis of a work on this subject, published by themselves, which is in my possession, enable you to form some idea of the value of the astronomical attainments of that singular people.

“November 1854.”

A Method of finding the Greenwich Mean Time at Sea by Computing the Moon's true Right Ascension from the observed Lunar Distance. By M. C. Rümker.

(Communicated by the Astronomer Royal.)

“When the observed distance of the star from the moon is small and the difference of their declination great, the error committed in determining the Greenwich mean time, by assuming the change of time proportional to that of the distance, can scarcely be compensated by the method of taking the difference of successive proportional logarithms, whereas the change of the moon's right ascension will be found more regular. I propose, therefore, to convert the observed sun's or star's distance from the moon into her true right ascension, whence the Greenwich mean time may be found by interpolation in the *Nautical Almanac* with so much the more ease and precision, as the moon's place is given there for every hour. Thus, moreover, the expense of the calculation and printing of the distances might be saved, and the volume of the *Almanac* become less voluminous.

“It remains, therefore, to be shown that the moon's true right ascension may be found with no less accuracy, and by a not more complicated calculation than the true distance.

“In order to determine the longitude, the mean time on board must be ascertained, whence the hour-angle of the star is known, and by subtracting this angle from their difference of right ascension, or adding it thereto, we obtain the hour-angle of the moon. Denoting now by α the difference of the true right ascensions of

the sun or star and the moon, by D , their apparent distance, by p, p' , their true, and by P, P' , their apparent polar distance; by t and $t' = \alpha \mp t$, their hour-angles; by z, z' , their zenith distances; by ϵ, ϵ' , their parallactic angles; by $\epsilon - \pi$, or $\pi' - \epsilon'$, the differences of refraction and parallax in altitude; by $d\alpha$ and dp , the effect thereof on the right ascension and polar distance; by ϕ' , the geocentric latitude of the place of observation, lest at sea it might be judged sufficient to assume the geographic latitude for it; then the strict formula, which answers to both bodies by substituting p' for p , ϵ' for ϵ , and $\pi' - \epsilon'$ for $\epsilon - \pi$, when applied to the moon, is

$$\frac{\sin t \cos \phi'}{\sin z} = \sin \epsilon, \quad \tan (\epsilon - \pi) \cos \epsilon = \tan n, \quad \frac{\sin n \tan \epsilon}{\sin (p \mp n)} = \tan d\alpha,$$

$$\tan \frac{(p \mp n)}{\cos d\alpha} = \tan P.$$

“The lower sign applies to the moon; but if ϵ is obtuse the signs must be changed.

“Generally it will be found sufficient to make

$$(\epsilon - \pi) \cos \epsilon' = dp \text{ and } \frac{(\epsilon - \pi) \sin \epsilon'}{\sin (p + P)} = d\alpha,$$

where the following practical rule may serve as guide or confirmation.

“When the parallactic angle ϵ' is acute, then is

$$\text{True Polar Distance} \begin{cases} p \text{ of the sun or star} - dp = \text{apparent polar distance } P \\ p' \text{ of the moon} + dp' = \text{apparent polar distance } P'. \end{cases}$$

“When the parallactic angle is obtuse the signs must be changed. Should any doubt exist whether ϵ is acute or obtuse, it must be found by another, to be shown hereafter. Then is, when A denotes the apparent difference of right ascensions,

$$\sqrt{\frac{\sin \frac{1}{2} (D + P - P') \cos \frac{1}{2} (D + P - P')}{\sin P \sin P'}} = \sin \frac{1}{2} A.$$

“If, now, the sun or star, and the moon, were observed on different sides of the meridian, then is

$$A + d\alpha - d\alpha = \alpha;$$

but if both bodies were observed on the same side, then is,

$$\begin{array}{ll} \text{When the sun or star was highest} & A - d\alpha - d\alpha' \\ \text{moon was highest} & A + d\alpha + d\alpha', \end{array}$$

and the sun's or star's right ascension $\pm \alpha =$ moon's right ascension.

“In the following example the reduction to the geocentric zenith has been neglected.

“Sept. 30, 1857, at $11^h 15^m 54^s$ mean time P.M., being then in $16^\circ 29'$ south latitude and $92^\circ 2'$ west longitude, a set of distances

of *Jupiter* from the moon's remote limb, with the corresponding altitudes, were observed from $22\frac{1}{2}$ feet elevation above the level of the sea, the height of the barometer being $29^{\text{in}}.6$; height of thermometer 14° Réaumur. The chronometer was $2^{\text{m}} 9^{\text{s}}$ slow of Greenwich mean time. The means gave

Chronometer.	Jupiter, East.	Moon.	Dist. of remote Limb.
$\begin{array}{r} \text{h} \quad \text{m} \quad \text{s} \\ 5 \quad 21 \quad 54 \text{ A.M., 31 Sept., Gr.} \\ + \quad 2 \quad 9 \\ \hline 5 \quad 24 \quad 3 \text{ Gr. M.T.} \end{array}$	$\begin{array}{r} \text{ }^{\circ} \quad ' \quad '' \\ 36 \quad 32 \quad 0 \\ \text{Dip } -4 \quad 42 \\ \hline \text{Ap. Alt. } 36 \quad 27 \quad 18 \\ \text{ } \varphi - \pi - 1 \quad 15.2 \\ \text{True Alt. } 36 \quad 26 \quad 3 \\ \text{Z = True Zen. Dist. } 53 \quad 33 \quad 57 \end{array}$	$\begin{array}{r} \text{ }^{\circ} \quad ' \quad '' \\ 68 \quad 53 \quad 37 \\ - \quad 4 \quad 42 \\ \hline 68 \quad 48 \quad 55 \\ \text{Moon's Ang. Sem. } 16 \quad 17 \\ \text{Ap. Alt. } 69 \quad 5 \quad 12 \\ \pi - \varphi + 20 \quad 34.7 \\ \text{True Alt. } 69 \quad 25 \quad 46.7 \\ \text{Z' } 20 \quad 34 \quad 13 \end{array}$	$\begin{array}{r} \text{ }^{\circ} \quad ' \quad '' \\ 69 \quad 26 \quad 18.2 \\ \text{Ang. Sem. } -16 \quad 16.7 \\ \text{D } 69 \quad 10 \quad 1.5 \end{array}$

“For the Greenwich mean time we find in the *Nautical Almanac* the sun's mean R.A. = $12^{\text{h}} 39^{\text{m}} 34^{\text{s}}.6$; the moon's Declin. $-11^{\circ} 8' 45''$; eq. hor. par. $58' 37''.7$; Red. -1 ; the moon's semid. $16' 0''.7$; *Jupiter's* R.A. $2^{\text{h}} 51^{\text{m}} 8^{\text{s}}.6$; Decl. $+14^{\circ} 59' 0''$; hor. par. $2''.0$; the moon's app. R.A. $22^{\text{h}} 33^{\text{m}} 34^{\text{s}}.6$.

“The hour-angle t of *Jupiter*, computed from his altitude results, $2^{\text{h}} 55^{\text{m}} 40^{\text{s}}.1$, which, being subtracted from their difference of R.A. $4^{\text{h}} 17^{\text{m}} 34^{\text{s}}.0$, leaves for the moon's hour-angle $t' = 1^{\text{h}} 21^{\text{m}} 53^{\text{s}}.9$. The parallactic angle of *Jupiter* is found, $\varepsilon = 55^{\circ} 45' 34''$, $d\alpha = 64''.35$, $P = 104^{\circ} 58' 17''.5$. For the moon we obtain $\varepsilon' = 72^{\circ} 40' 26''$, $d\alpha = 20' 0''.9$, $P' = 78^{\circ} 57' 22''.8$,

$\begin{array}{r} \text{h} \quad \text{m} \quad \text{s} \\ \text{A} \quad 64 \quad 42 \quad 18 \\ d\alpha \quad + \quad 1 \quad 4.35 \\ d\alpha' \quad - \quad 20 \quad 1.1 \\ \hline 64 \quad 23 \quad 21.25 \\ \alpha \text{ in time } 4 \quad 17 \quad 33.41 \\ \text{Jupiter's R.A. } 2 \quad 51 \quad 8.60 \\ \text{Comput. R.A. of Moon } 22 \quad 33 \quad 35.19 \\ \text{Moon's R.A. at } 17^{\text{h}} \quad 22 \quad 32 \quad 44.37 \\ 18^{\text{h}} \quad 22 \quad 34 \quad 51.12 \\ \text{Diff. } 0 \quad 50.82 \\ \text{Diff. } 2 \quad 6.75 \\ \text{Green. M.T. } 17 \quad 24 \quad 3.4 \\ \text{M.T. on board } 11 \quad 15 \quad 54.0 \\ \text{Long. in Time } 6 \quad 8 \quad 9.4 = 9^{\circ} 2' 21'' \text{ West.} \end{array}$	$\begin{array}{r} \text{h} \quad \text{m} \quad \text{s} \\ 3600 \\ \text{Log } 3.556303 \\ \text{log } 1.706035 \\ \text{log C } 7.807052 \\ \hline 3.159390 \end{array}$
---	--

“It is true that an error in the polar distances will affect the calculation of the difference of right ascension, under the above-mentioned supposition of a small distance and a proportionally great difference of declination, more than under more favourable circumstances. But it is equally evident that a *tabular* error of declination will influence, in the same measure, the true distance in the *Nautical Almanac*, which, in that case, will be affected with nearly the whole error of the declination, whereas the influence of

any faults in the refraction and parallax, arising from erroneously observed altitudes, will remain the same, whether $\varphi - \pi$ is divided in its effects upon the distance, or upon right ascension and polar distance. Indeed, we may say the same as to the clearing of the apparent distance, when the difference of azimuths is small, and the difference of altitudes great, where then the true distance will be affected with nearly the entire errors of refraction and parallax in altitude. Hence it follows that, with respect to accuracy, there is no other difference between the two methods, than that the interpolation may be achieved more correctly by means of the right ascensions given for every hour, and that the distances may be spared. Nor offers, when the altitudes have been observed, the method proposed by me any advantages with respect to the numerical calculation. But setting aside that little dependency can be placed upon the altitudes of stars observed above the sea-horizon, on account of the variable terrestrial refraction, and that this horizon can scarcely be distinguished at night, it should be remembered that even in the day-time the altitude of the moon's crescent, when high and faint, is difficult to be observed, and that when the line joining her cusps is perpendicular to the horizon, her real upper and lower limbs are invisible; and as it may hardly be expected that the more disinterested assistants, with their not always well-adjusted quadrants, will be sufficiently attentive to the given signal, it must be owned that, if the chronometer, or approximate Greenwich time, is but known within moderate limits, the declination of the heavenly bodies is a more certain argument than their altitudes, and that computed altitudes of the moon and stars are generally better than the observed altitudes. Not to expatiate, I will only remark, that if the latitude is sufficiently known, the mean time on board may always be obtained by altitudes of the sun observed previous or subsequent to the distance, and almost independent of the latitude, twice a-day when the sun is in the prime vertical; so that, with the assistance of a good time-piece and the log, the mean time may be known at all times of the day, and be controlled by observations on the next day. It will, therefore, be advisable, when a lunar distance has been taken, at least to confirm or to correct the observed altitudes by computation, which offers the opportunity of introducing the geocentric latitude; and in that case, the method of finding the Greenwich time, by the right ascension of the moon, requires less logarithms than a correct method of clearing the distance.

“The parallactic angles and the altitudes may be found by any other formula, but I propose the following:—

$$\cot \phi' \cos t = \tan m, \frac{\cot t \sin(p \mp m)}{\sin m} = \cot \epsilon', \cot(p \mp m) \cos \epsilon' = \tan h$$

where ϕ' is the geocentric latitude, m an auxiliary arc, h the altitude; the lower sign must be used when the hour-angle is obtuse.

“May 29th, 1857, in latitude $53^{\circ} 33'$ North, and longitude

$9^{\circ} 58' 30''$ East, of distances of the sun's and moon's limbs were observed, corresponding to a watch regulated to mean time. Barometer $29^{\text{in}}.9$ Thermometer 15° Réaumur.

Mean of Times.

$\begin{array}{c} \text{h} \quad \text{m} \quad \text{s} \\ 4 \quad 39 \quad 54 \text{ P.M.} \end{array}$

Mean of Distances.

$\begin{array}{c} \text{h} \quad \text{m} \quad \text{s} \\ 79 \quad 29 \quad 36.5 \\ 15 \quad 36.5 \\ 15 \quad 47.5 \end{array}$

Appt. Dist. D $\begin{array}{c} 80 \quad 1 \quad 0.5 \end{array}$

"From the *Nautical Almanac* we obtain sun's mean R.A. $4^{\text{h}} 28^{\text{m}} 29^{\text{s}}.49$; sun's true R.A., $4^{\text{h}} 25^{\text{m}} 36^{\text{s}}.623$; equat. of time, $+2^{\text{m}} 52^{\text{s}}.9$; sun's Decl., $+21^{\circ} 41' 14''.3$; sun's semid., $15' 48''.5 - 1'$ contract; moon's R.A., $10^{\text{h}} 4^{\text{m}} 28^{\text{s}}.45$; moon's Decl., $+15^{\circ} 2' 35''.8$; moon's semid. $15' 24''.5$ + augmen. $12''$; moon's eq. hor. par. = $56' 24''.8$, Red. for spheroid = $7''.2$; geocentric latitude $\phi' = 53^{\circ} 22' 10''$, $t = 70^{\circ} 41' 43''.5$, $t' = 14^{\circ} 1' 15''$.

"Thence we find for the sun $\epsilon = 39^{\circ} 55' 41''$, $Z = 61^{\circ} 19' 29'' = \epsilon - \pi$ by second approx. $= 1' 44''.3$; $d\alpha = 1' 12''.05$; $P = 68^{\circ} 17' 26''$.

"For the moon $\epsilon' = 13^{\circ} 1' 40''$; $Z' = 39^{\circ} 53' 8''.5$; $\pi' - \epsilon' = 35' 45''.5$; $d\alpha' = 8' 19''.48$; $P' = 75^{\circ} 32' 14''.3$; $A 84^{\circ} 50' 9''.0$; $\alpha = 84^{\circ} 43' 1''.57$, in time $5^{\text{h}} 38^{\text{m}} 52^{\text{s}}.105$, which, being added to the sun's true R.A. $4^{\text{h}} 25^{\text{m}} 36^{\text{s}}.623$, gives for the moon's true R.A. $10^{\text{h}} 4^{\text{m}} 28^{\text{s}}.728$, whence the longitude will be found $9^{\circ} 58'.24$."

On the Connexion between the Sun's Motion and the Variations of Terrestrial Magnetism. By Professor Secchi.

(Extract of a Letter to Capt. Manners, R.N.)

"Colonel Sabine, as you know, has published and discussed with admirable sagacity an immense mass of observations of the phenomena of terrestrial magnetism, and in the last volume of the the Toronto Observations has shown that in the tropical regions the opposition of oscillation of the needle follows so strictly the change of the sun's declination, that the change of the former can be traced to the very day of the equinox. This consequence, although apparent from the curves of the tropical countries, was not so clearly perceived in the countries more distant from the tropics. But it was evident, that if the law was true, it would become visible everywhere, provided a suitable mode of analysis should be applied. I thought, therefore, that the want of its being apparent there, was due to the kind of graphical analysis used until now, which consists in referring the monthly curves, either to the absolute mean of the year, or to the mean of the month itself. I undertook, therefore, to refer the monthly curves to the mean annual hourly curve of the year. The reason of doing so is this: the effect of diurnal variation at any hour (as far as it depends on the sun) is the complex effect of its hour-angle and of declination. The mean annual hourly curve, as deduced from the observations of the whole year, is a residual function independent of the declination which acts in opposite directions in